


# Transcatheter Arterial Embolization for Unilateral Active Adrenal Hemorrhage that Developed after Coronavirus Disease 2019 Infection: A Case Report

Tensei Suzuki<sup>1</sup>, Hidenori Yamaguchi<sup>2\*</sup>, Mitsuaki Kojima<sup>1</sup>, Toshiya Kariyasu<sup>2</sup>, Tomohisa Shoko<sup>1</sup>

<sup>1</sup>*Emergency and Critical Care Medicine, Tokyo Women's Medical University Adachi Medical Center, Tokyo, Japan*

<sup>2</sup>*Department of Radiology, Tokyo Women's Medical University Adachi Medical Center, Tokyo, Japan*

\*Correspondence: Hidenori Yamaguchi, Department of Radiology, Tokyo Women's Medical University Adachi Medical Center, 4-33-1, Kouhoku, Adachi Ku, Tokyo To, 123-8558, Japan

 yamaguchi.hidenori@twmu.ac.jp

Radiology Case. 2024 August; 18(8):21-26 :: DOI: 10.3941/jrcr.5404

## ABSTRACT

**Case presentation:** A 73-year-old previously healthy man presented to our hospital with sudden right-sided abdominal pain. The patient had a history of coronavirus disease 2019. Contrast-enhanced computed tomography of the abdomen revealed a right adrenal hemorrhage. Urgent transcatheter arterial embolization was performed: the middle adrenal artery was embolized. Follow-up computed tomography after 3 days revealed a shrunken hematoma. Several tests performed the day after admission revealed no suspected causes other than coronavirus disease 2019 infection, including neoplastic diseases. Since the patient's condition was stable, he was discharged after 8 days of hospitalization.

**Conclusion:** We encountered a case of post-coronavirus disease 2019 unilateral adrenal hemorrhage, wherein the infection may have increased the risk of bleeding or thromboembolism. However, the exact frequency of adrenal hemorrhage secondary to coronavirus disease 2019 remains unknown. Hence, clinicians should be aware that adrenal hemorrhage might be a possible delayed consequence of coronavirus disease 2019.

## CASE REPORT

### CASE DESCRIPTION

A 73-year-old previously healthy Japanese man presented to the hospital with sudden right-sided abdominal pain. The patient had a medical history of hypertension, glaucoma, and coronavirus disease 2019 (COVID-19) but no other history of abdominal trauma, anticoagulant use, or neoplastic or autoimmune disease. Three weeks before the presentation, the patient was diagnosed with COVID-19. Since the only symptom was fever, the patient did not require oxygen or antiviral medications, wherein the symptoms were in remission with home care.

On visiting the hospital, the vital signs of the patient were stable. However, he experienced intense right-sided abdominal pain. COVID-19 antigen test results were negative.

Blood work revealed white blood cell count, 21,700/ $\mu$ L; C-reactive protein level, 26.73 mg/dL; hemoglobin level, 11.2 g/dL; platelet count,  $22.0 \times 10^4$  / $\mu$ L; quantitative fibrinogen level, 200 mg/dL; fibrin degradation product level, 8.8  $\mu$ g/dL; and D-dimer level, 5.1  $\mu$ g/dL, which indicated an elevated inflammatory response and significantly high D-dimer level; without associated anemia or thrombocytopenia.

### Imaging findings

Contrast-enhanced computed tomography (CT) of the abdomen revealed a right adrenal hemorrhage (Figure 1).

### Management

Urgent transcatheter arterial embolization (TAE) was performed. The middle adrenal artery through a 4F catheter (shepherd hook; Medikit Co. Ltd., Miyazaki, Japan) demonstrated extravasation and was embolized with 33% *n*-butyl-2-cyanoacrylate using a microcatheter (BISHOP; PIOLAX, Inc., Yokohama, Japan; (Figure 2). After embolization, the superior and inferior adrenal arteries were enhanced. However, there was no extravasation. Follow-up CT performed 3 days later showed that the hematoma had shrunk (Figure 3).

Various tests were performed on the day after admission to determine the cause of the adrenal hemorrhage. However, no neoplastic disease was identified because the laboratory test results revealed adrenaline level, 87 pg/ml; dopamine, 19 pg/ml; cortisol, 14.6  $\mu$ g/dl; dehydroepiandrosterone sulfate, 78  $\mu$ g/dl; and aldosterone-to-renin ratio, 17. Noradrenaline was mildly elevated (766 pg/ml); we attributed this mild elevation to the effect of noradrenaline on blood pressure during the initial course of treatment.

### Follow-up

Since the patient achieved a stable general condition, he was discharged after 8 days of hospitalization. During the course of hospitalization, there was also no evidence of hypertension that might have been associated with adrenal hemorrhage (Figure 4).

A follow-up CT performed 3 months later also confirmed further hematoma shrinkage (Figure 5).

## DISCUSSION

Adrenal hemorrhage is a rare disease, estimated to be present in approximately 0.14–1.8% on postmortem examinations [1,2]. The causes of adrenal bleeding can be primary/idiopathic (those with an unclear cause) or secondary (those caused by various factors, including abdominal trauma, infections, septicemia, anticoagulant use, pregnancy, acute stress, neonatal stress, surgery, neoplastic diseases, and autoimmune diseases, such as systemic lupus erythematosus and antiphospholipid syndrome) [3]. More recently, COVID-19-related adrenal hemorrhage has been reported. However, the number of cases is small [4]. Herein, we report a novel case of unilateral active adrenal hemorrhage that developed 3 weeks after COVID-19 infection.

Several studies have reported associations between coagulopathy and COVID-19 infection [5]. This coagulation disorder may cause thrombosis of the adrenal vein, leading to adrenal hemorrhage. In a complete autopsy study of patients who died of severe COVID-19, adrenal lesions were observed in approximately 42% of patients [6].

The pathophysiology of adrenal hemorrhage due to coagulopathy has been suggested to be an outcome of the unique blood supply of the adrenal glands. Each adrenal gland has three arterial vessels, with only one vein.

Therefore, regarding vein thromboses, intra-glandular blood pressure tends to rise, and the intravenous epinephrine concentration also increases, leading to adrenal hemorrhage [7–9].

However, there are only a few reports of adrenal hemorrhage associated with COVID-19.

According to a systematic review published by Elhassan et al., only 7 patients with COVID-19 infection-related adrenal hemorrhage have been reported. All patients had positive COVID-19 polymerase chain reaction (PCR) tests. The median duration between the positive COVID-19 PCR test and radiological detection of adrenal hemorrhage was 8 days (range, 1–30 days) [4].

### Etiology and demographics

In our case, the patient was a 73-year-old Japanese male with negative COVID-19 antigen test results. However, in the systematic review, adrenal hemorrhage was defined as potentially COVID-19-related if the patient had a positive PCR test within

30 days before the detection of the adrenal abnormality. This case fulfills that definition because the adrenal hemorrhage developed 21 days after COVID-19 infection. Of the 7 cases with COVID-19 infection-related adrenal hemorrhages, 4 had bilateral adrenal hemorrhages, while 3 had unilateral adrenal hemorrhages. All 3 patients with unilateral adrenal hemorrhage were asymptomatic and diagnosed incidentally on imaging studies to evaluate COVID-19 chest infection. One patient was pregnant at the time of adrenal hemorrhage diagnosis and had an underlying indeterminate adrenal non-functioning tumor that was previously unknown. In contrast, the other two had no risk factors for bleeding [4].

Our case is unique in that, even though the lesion was unilateral and there were no risk factors for bleeding, the patient had very severe abdominal pain.

Adrenal insufficiency is often complicated by bilateral adrenal hemorrhage. However, even unilateral cases can be complicated by adrenal insufficiency due to microinfarction of the contralateral adrenal gland [10–12].

In the present case, there were no findings suggestive of adrenal insufficiency, such as hypotension or low sodium levels, and the patient's condition was stable after TAE. Therefore, the patient was discharged after only one week of hospitalization.

Our study has a few limitations, including the limited follow-up and lack of certainty regarding whether this case was idiopathic or COVID-19-related. Nevertheless, adrenal hemorrhage is rare and can lead to death, and emergency interventional radiology can improve survival.

In summary, we present a case of unilateral adrenal hemorrhage that developed after COVID-19 infection. COVID-19 disease may cause an increased risk of bleeding or thromboembolism. However, the exact frequency of adrenal hemorrhage secondary to COVID-19 remains unclear. Clinicians should, therefore, be aware that adrenal hemorrhage could be a possible delayed consequence in patients with a history of COVID-19.

### TEACHING POINT

Adrenal hemorrhage, although rare, could be a possible delayed consequence in patients with a history of coronavirus disease 2019. If adrenal hemorrhage is identified on contrast-enhanced computed tomography, emergency transcatheter arterial embolization could be the treatment protocol.

### Authors' contributions

TS: Performed the literature review, curated the data, and wrote the original draft of the manuscript. HY: Performed the technique and wrote and edited the manuscript. MK: Performed the literature review and wrote and edited the manuscript. TK: Performed the literature review and edited the manuscript. TS: Wrote and edited the manuscript. All authors read and approved the final manuscript.

## ACKNOWLEDGEMENTS

We would like to thank all of the Department of Emergency Medicine staff at Tokyo Women's Medical University Adachi Medical Center for their support in the treatment of patients.

## DISCLOSURES

The authors declare that they have no conflict of interest. This study was not supported by any funding.

## CONSENT

Yes

## HUMAN AND ANIMAL RIGHTS

Not applicable

## QUESTIONS

**Question:** Which of the following answer choices are false?

1. In patients with coronavirus disease 2019, adrenal hemorrhage is a complication.
2. The unique blood supply of the adrenal glands can cause adrenal hemorrhage.
3. Bilateral adrenal hemorrhage often complicates adrenal insufficiency.
4. Trauma is the only known cause of adrenal hemorrhage. (applies)
5. Coronavirus disease 2019 does not complicate coagulation abnormalities. (applies)

### Explanation:

1. Adrenal hemorrhage is a complication in patients with COVID-19. [In a complete autopsy study of patients who died of severe COVID-19, adrenal lesions were observed in about 42% of patients.]
2. Fewer outflow tracts compared to inflow tracts is a known cause of adrenal hemorrhage. [The pathophysiology of adrenal hemorrhage due to coagulopathy has been suggested to be an outcome of the unique blood supply of the adrenal glands.]
3. Bilateral adrenal hemorrhage often complicates adrenal insufficiency. [Adrenal insufficiency is often complicated by bilateral adrenal hemorrhage.]
4. There are various known causes of adrenal hemorrhage other than trauma. [The causes of adrenal bleeding can be primary/idiopathic (those with an unclear cause) or secondary (those caused by various factors, including abdominal trauma, infections, septicemia, anticoagulant use, pregnancy, acute stress, neonatal stress, surgery, neoplastic diseases, and autoimmune diseases, such as systemic lupus erythematosus and antiphospholipid syndrome).]
5. Coagulation abnormalities are known to complicate COVID-19. [Several studies have reported associations between coagulopathy and COVID-19 infection.]

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## FIGURES

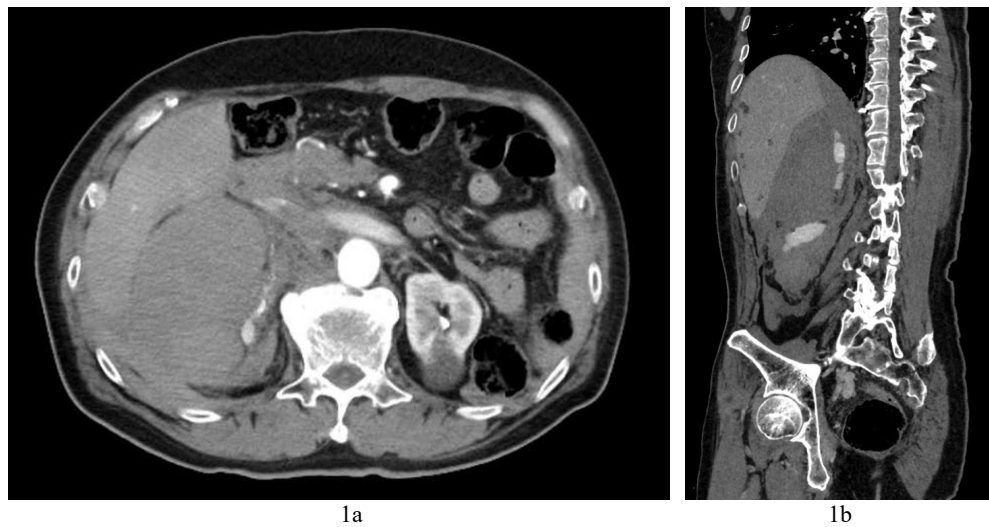


Figure 1: A 73-year-old Japanese male patient with a history of COVID-19 infection, presenting with intense abdominal pain associated with adrenal hemorrhage. FINDINGS: Abdominal contrast-enhanced computed tomography shows active extravasation of contrast from the right adrenal gland. TECHNIQUE: Axial and sagittal CT

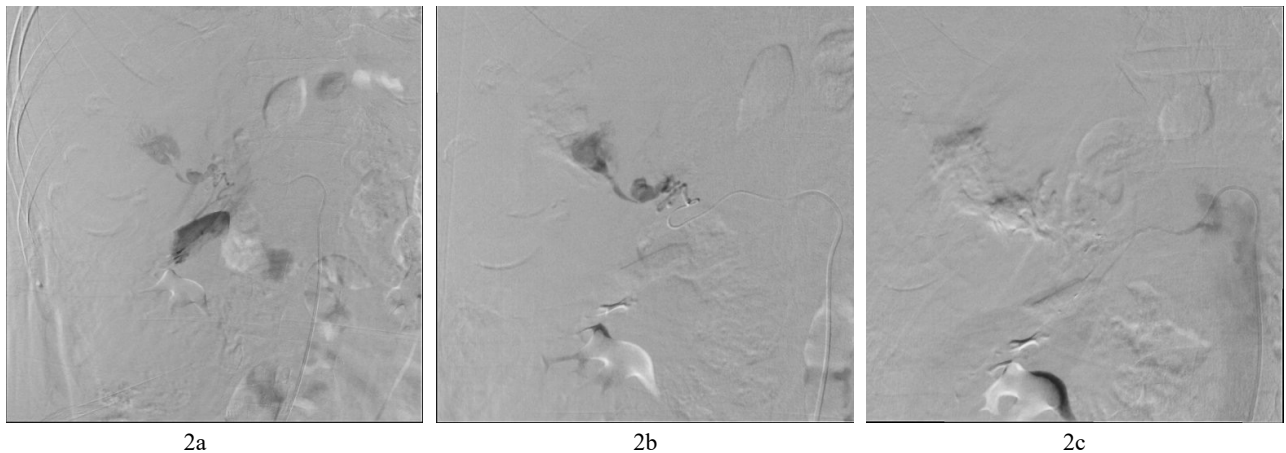
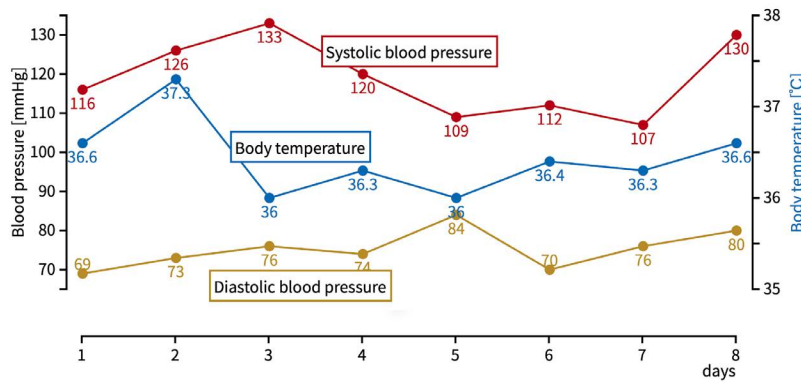


Figure 2: A 73-year-old Japanese male patient with a history of COVID-19 infection, presenting with intense abdominal pain associated with adrenal hemorrhage. FINDINGS: (a) Angiography of the middle adrenal artery through a 4F catheter demonstrates extravasation. (b) Angiography of the middle adrenal artery through a microcatheter demonstrates extravasation. (c) After embolization, angiography of the middle adrenal artery demonstrates the disappearance of the extravasation from the middle adrenal artery. TECHNIQUE: Digital subtraction angiography



**Figure 3:** A 73-year-old Japanese male patient with a history of COVID-19 infection, presenting with intense abdominal pain associated with adrenal hemorrhage. FINDINGS: A follow-up computed tomography taken 3 days later indicates that the hematoma has shrunk. TECHNIQUE: Axial CT



**Figure 4:** A 73-year-old Japanese male patient with a history of COVID-19 infection, presenting with intense abdominal pain associated with adrenal hemorrhage. FINDINGS: The clinical course after admission indicates that there is no evidence of hypertension that may be associated with adrenal hemorrhage.



**Figure 5:** A 73-year-old Japanese male patient with a history of COVID-19 infection, presenting with intense abdominal pain associated with adrenal hemorrhage. FINDINGS: A follow-up computed tomography performed 3 months later indicates that the hematoma has further shrunk. TECHNIQUE: Axial CT

## KEYWORDS

*Abdominal Pain; Adrenal Insufficiency; Coronavirus Disease 2019; Hemorrhage; Interventional Radiology*

## ABBREVIATIONS

CT = Computed Tomography  
PCR = Polymerase Chain Reaction  
Covid-19 = Coronavirus Disease 2019  
TAE = Transcatheter Arterial Embolization

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